THE METAL INDUSTRY

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RADE JOURNAL

RELATING TO THE NON-FERROUS METALS AND ALLOYS.

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NICKEL

SILVER

GOLD

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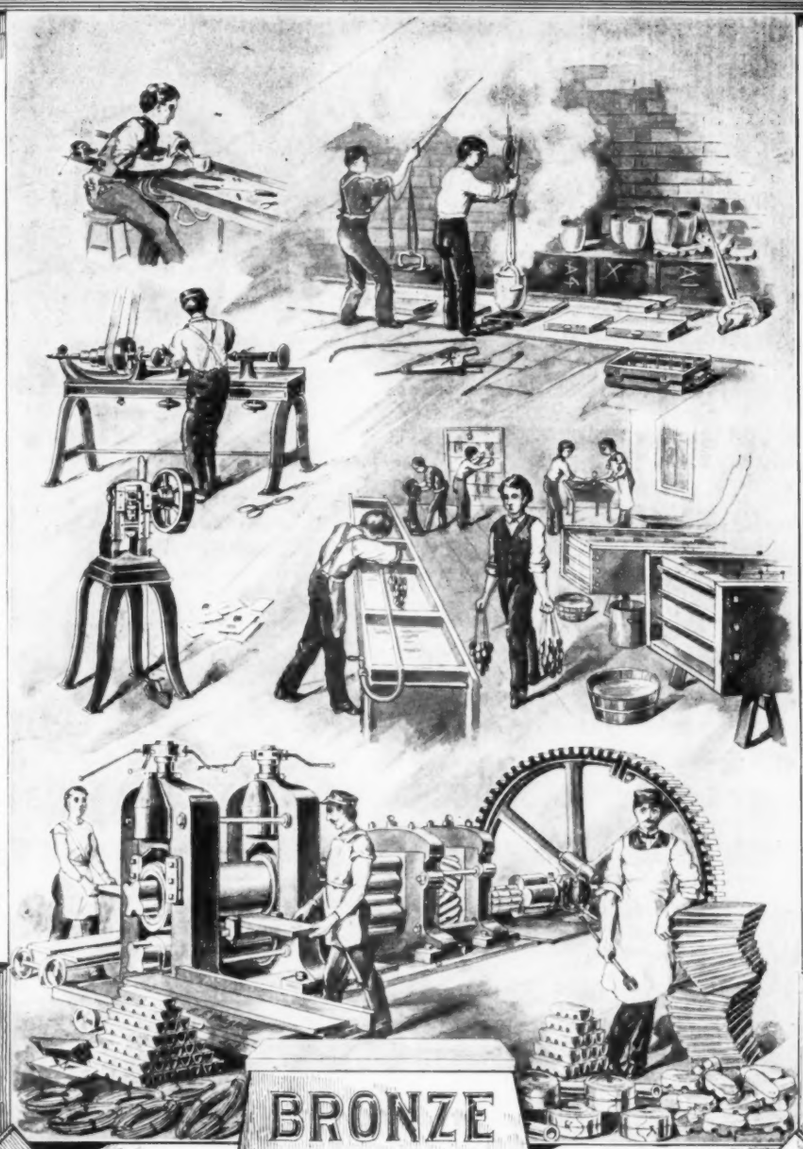

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BRONZE

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Vol. X. No. 7.
Vol. II. No. 7.
NEW SERIES

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JULY, 1904

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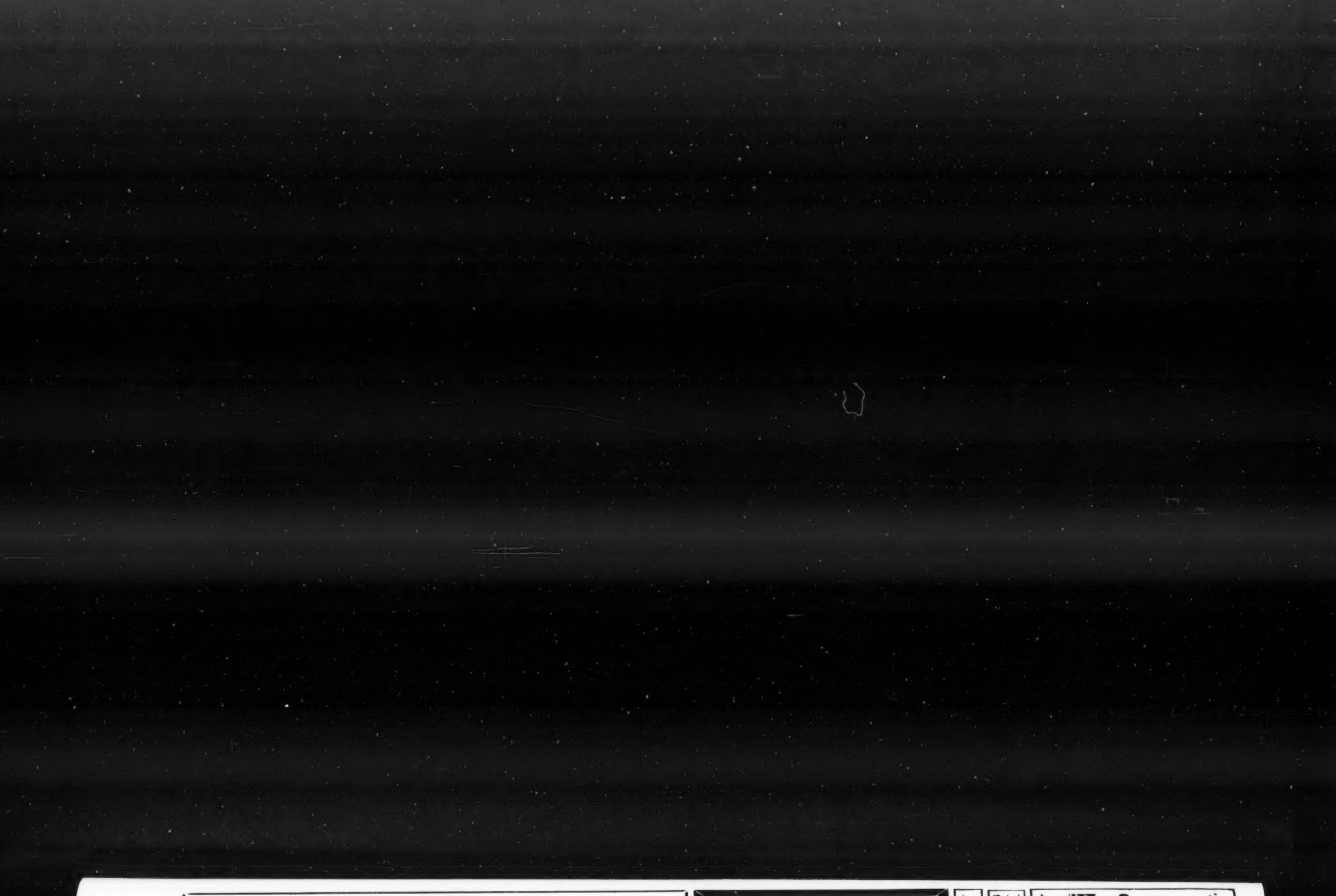

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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, AND ELECTRO-PLATERS REVIEW.

A TRADE JOURNAL RELATING TO THE NON-FERROUS METALS AND ALLOYS.

OLD SERIES VOL. X., NO. 7. | NEW YORK, JULY, 1904 | NEW SERIES VOL. II., NO. 7.

THE METAL INDUSTRY AND THE ALUMINUM WORLD AND THE BRASS FOUNDER AND FINISHER AND ELECTRO PLATERS REVIEW

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CONTENTS

INGOT COPPER.

The increasing use of electrical appliances has carried with it a corresponding increase in the quality of copper which is found on the market. As there is no test, chemical or physical, which can at all approach that of electrical conductivity for the determinaton of the purity of copper this method of testing has now become standard and widely used. All copper wire used for electrical purposes must pass the requirements of conductivity, and, therefore, purity, before it can be used, and such copper, be it Lake or electrolytic, cannot be otherwise than good. It will make good brass or other copper alloys. We regret to say, however, that we have found that certain copper producers have been accustomed to take advantage of the fact that only copper wire is tested for conductivity and that ingots and cakes are allowed to go untested. Metal of a quality which would not pass inspection in the billet is, accordingly, accepted in the ingot or cake without question.

Such a condition is especially true of ingot metal, as cakes have to pass the rolling test while the ingot is simply made into brass, and if the quality of this alloy is unsatisfactory the caster is usually censured. It is customary to rely implicitly upon the reputation of the smelter for the purity of the ingot. Now herein lies the difficulty. All copper smelters have slags produced in their refining furnace in which impurities exist. These slags are reduced in the cupola to metal, which is again returned to the refinery with further concentration of impurities. Copper made from slag metal is much more difficult to refine than otherwise, and the resulting copper ingot is apt to be of somewhat low conductivity and, therefore, more or less impure. Realizing that the consumer does not test the ingots, it is customary to put this copper into this particular form and leave the brand to do the rest.

We have recently had many cases of this kind brought to our notice in which the results were unsatisfactory, but the ingot metal and cakes were of the best known brands. A heel of one of the copper ingots forged down under a steam hammer, drawn into wire, and tested for electrical conductivity gave only 83 per cent. Further investigation proved that the concentration of impurities in the slag was responsible for the condition.

We believe that this condition of affairs exists much more flagrantly in the Lake smelters than the electro-

lytic, as the latter are constantly on the alert to check any contamination of this kind. The name of Lake copper, however, has become such a familiar word that we are apt to overlook any possible contamination of the material. The smelter's claim is that in ingot metal there is nothing specified in the way of conductivity and that the ingot is lake copper. To be sure it is, but unless the results obtained from its use are satisfactory, the difference in price which exists between lake copper and electrolytic must soon disappear and the two be placed on a parity. We believe that it is not imposing a hardship upon the smelter to expect him to furnish as good copper in the ingot as he does in the wire bar. Such a condition, however, has been so difficult to bring about that some brass mills are buying wire bars and cutting them up so that they may be used in the crucible. The day does not appear far distant when all copper, ingot, cake, or wire bar will be uniformlv tested for conductivity.

THE INCREASING USE OF STERLING SILVER.

The familiar heirlooms of our ancestors in the shape of solid silver spoons or other articles of a similar nature brings to our mind the care with which these were treasured and the difficulties under which they were obtained. Indeed, it scarcely seems but a few years back when only the wealthy could afford solid silverware, but now there are but few homes in which this ware does not enter in some form or other.

We must not believe that this increasing use has been brought about entirely by the low price of silver, but investigation will demonstrate that it is the improved method of working the metal which is responsible for the extended employment of sterling silver at the present time. Watch the so-called silversmith at his work and it will be readily seen that the operation is almost entirely one of hand work. A bar of silver is hammered until the shape of the spoon is produced, and then, by filing, chasing, grinding and polishing, the finished article is completed. It is not surprising that the cost of such articles are high; and, as the art of silversmithing has not changed in many decades, our early wares were wrought in this manner. The labor put upon the goods determines the price.

Again, let us watch the modern manufacture of sterling flatware and we will discover the vast difference between him and the silversmith. Instead of the bar, a sheet is used, and the spoons or forks are blanked, graded, stamped polished, in exactly the same manner that German silver is produced for the plated article. The operations of making a sterling silver spoon are the same as that of making a German silver one, and the cost, therefore, is no more. When the price at which the unplated German silverware can be purchased is taken into consideration the actual cost of making sterling silver flatware will be readily realized. It is principally to this fact that solid silverware can be purchased at so moderate a price, and that the makers of such ware report constantly increasing business. Each year will witness the increase of solid silver goods, and even to-day the manufacture is not confined to a few, as in the past, but is distributed among nearly as many makers as those who produce plated ware. The dubious feeling which existed at one time about the purity of sterling goods has now disappeared, and we believe that those who have entered the manufacture of these wares will not regret their step.

THE MICROSCOPE IN THE METAL INDUSTRY.

The microscope has gained a firm foothold in the metal industry, although there are yet many who are skeptical about its true value. Some seem to think that it is possible to investigate the interior of a casting by means of the microscope and are disappointed when they find that they cannot. Others believe that this instrument will serve to inspect a full sheet or plate of metal, and so determine its fitness for certain uses. Nothing could be further from the truth.

The microscope can only be employed to observe the surface of an object and then only in minute portions. By its means we may be able to locate a hidden flaw, but we cannot determine how many more there are. The instrument is not intended for such inspection. Its only use lies in the determination of the structure of metals and alloys; beyond this its field is limited.

The heat treatment of metals has been found to play an extremely important part in the determination of the character of metals and alloys, and were it not for the microscope this fact would never have been discovered. The microscope has already proved so valuable in the steel industry in finding out whether a steel has been properly treated that its use in the metallurgy of the non-ferrous alloys must likewise be valuable. In annealing, upon which so much depends, the microscope will be found extremely useful, as it will enable the manufacturer to determine whether the metal has been "burned" or overheated in the muffle or whether it has been annealed at the proper temperature. In cast metal the microscope will also be found valuable in discovering whether the plate or bar has been cast at the normal temperature. In the use of this valuable instrument, however, one must not expect to obtain results immediately, but he must be quite patient until it has been determined when a structure seen or photographed by means of the microscope is good or bad. Until this point has been arrived at the microscope is valueless. To determine such a condition may consume a long time, but when once found it will repay for the labor and time consumed.

THE BATES-PEARD PROCESS FOR ANNEALING.

By Darwin Bates, M. I. E. E., and G. W. Peard.
(Huyton, Liverpool, England.)

In the April issue of THE METAL INDUSTRY there appeared an article on "Annealing in Steam" which has been read by us with much interest. We believe, however, that the article does not fully grasp the underlying principles of the Bates-Peard process for the production of annealed metals without oxidation, and we therefore take pleasure supplementing the previous article with additional information which we trust will enable the reader to more fully understand our process and realize its value.

We would point out in the first place that steam used in the process of annealing is old in the Patent Law sense, as steam in connection with heating metal and annealing was patented in England on June 16, 1888, by G. W. Gesner, of New York (No. 8862). Cummins patent claim is for the use of steam and steam only, and, therefore, was anticipated by Gesner, and Cummins had to use steam not only for the object of driving the atmosphere out of the furnace on every occasion when the door of the furnace was opened to put in a fresh batch of material, but also for the purpose of keeping the atmosphere out when the flap was opened at the discharge end to admit the rake used for hooking the annealed articles out. The water tank was used by Cummins solely for the purpose, and only claimed by him as a method of cooling the annealed articles below the oxidizing temperature.

Cummins' process was tried in its early stages both in America and England, and it failed entirely for two reasons, viz.:

1.—Because it was found impossible in practice to exclude the atmosphere entirely when opening the doors or flaps, and, consequently, the annealed articles were liable to be discolored.

2.—The wire coils which were tried, more often than not came out of the furnace in a condition known in the trade as "matted"—a fatal objection—and which was due to Cummins not having mastered the fundamental principles underlying the process of bright annealing. In consequence of these failures, Cummins' English patent was abandoned.

In the Bates-Peard method, steam is not claimed, and it is not necessary to the process to provide an inlet of live steam as in Cummins, because the heated portion of the furnace itself is never open to the atmosphere. In the Bates-Peard method water is not used only as a cooling medium, the water at each end of the annealing chamber is used for the purpose of doors or trapped entrance and exit of the heating chamber is of such form that it will admit and let out metal in any form and, at the same time, absolutely exclude any particle of atmospheric air for the heating chamber, which constitutes the main feature of the Bates-Peard process. This form of furnace lends itself particularly to the adaptation of an endless chain or belt traveling through the furnace and makes the process an automatic one of certain action. This enables the cost of production to be reduced to a figure hitherto undreamed of.

For the purpose of enabling your readers to better understand the Bates-Peard process we illustrate a section (Fig. 1) of our furnace showing the design for the annealing furnace with an automatic conveyor, and the claims covering the same in United States Patent No. 716,618 December 23, 1902, are as follows, viz.:

A.—"An apparatus for annealing bright metals, comprising an annealing chamber having a depending mouthpiece at each end, liquid vessels into which the said mouths depend, and means for withdrawing the metal from said chamber through one of said mouths and vessels, substantially as described."

B.—"An apparatus for annealing bright metals, comprising an annealing chamber having a depending mouthpiece at each end, liquid vessels into which said mouths depend and an endless conveyor passing through the chamber, substantially as described."

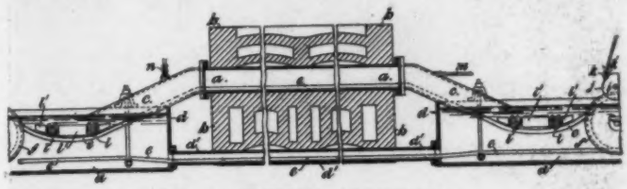


FIG. 1.—SECTION OF FURNACE.

C.—"Apparatus for annealing bright metals comprising a closed annealing chamber 'A' (Fig. 1), a heating furnace 'B,' a downwardly-inclined mouth 'C' at each end of said chamber, a tank 'D' at each end adapted to contain water, and into which the ends of the mouths 'C' dip, and an endless conveyor 'E' for the metal passing through the chamber, mouths and water substantially as set forth."

The following extract from text of the same Patent Specification will also show that the idea of using any other inert or non-oxidizing gas in place of steam, in conjunction with the double water seal and automatic conveyor, was contemplated and covered by Bates and Peard patent.

"The steam of other inert or non-oxidizing gas employed in the annealing retorts or chambers 'A' for the purpose of excluding the atmosphere is suitably introduced by the pipe 'M' in one of the mouths 'C,' and there will also be used in connection with it a tap 'N,' say on the other end, for the outlet of the air removed or when blowing through. The pressure of the steam or gas should be slightly in excess of the atmospheric pressure. In some cases, however, the steam may be dispensed with and the oxygen of the air may be absorbed by the passing of some suitable metal or material through the annealing chamber at the commencement of the working."

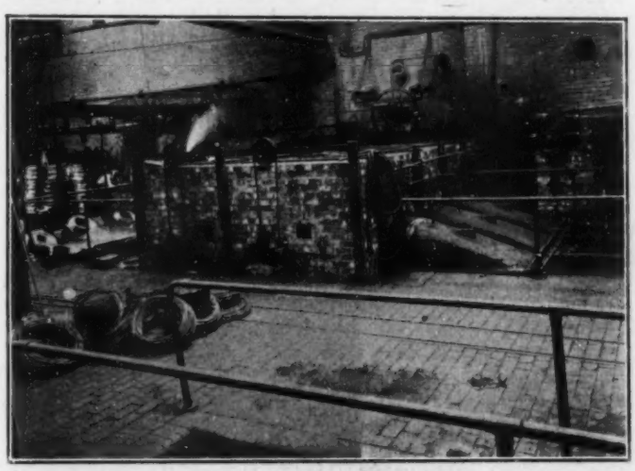


FIG. 2.—VIEW OF FURNACE.

Having now more particularly described the Bates-Peard United States Patent and explained what are the main differences between the Cummins and Bates-Peard Patents, we would say that the patent expert's and American attorney's opinion have been obtained.

Both consider the Bates-Peard patent valid as far as any previous patent in the United States is concerned, and that it could be maintained despite the Cummins patent, and this being so, negotiations are proceeding

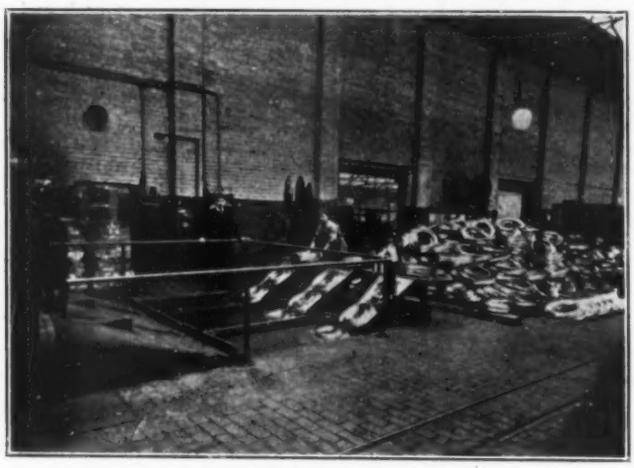


FIG. 3.—LOADING END OF FURNACE.

for the purpose of installing the Bates-Peard process in several United States mills.

Notwithstanding the fact that the patents are so recent, the Bates and Peard furnaces are being worked successfully in mills in Germany and England, and are protected by 12 separate patents in the following countries, viz.: England, United States, Germany, France, Belgium, Italy, Russia, Japan.

In conclusion we would say that it is doubtful whether Cummins' patent could be maintained if contested, as Gesner's patents ante-date Cummins', and, having been abandoned, leave the field open for any one to use steam for annealing. Moreover, in the Bates-Peard process steam is not essential, although, of course, it is the most easily handled medium for the purpose, the real claims lying in the double water seal in conjunction with the automatic conveyor. In any event the present value of Cummins' patent is small considering that it expires in 1907, while the Bates-Peard patents do not expire until 1919, and if a comparison of cost of annealing per ton by each process be taken, the result is disastrous for Cummins.

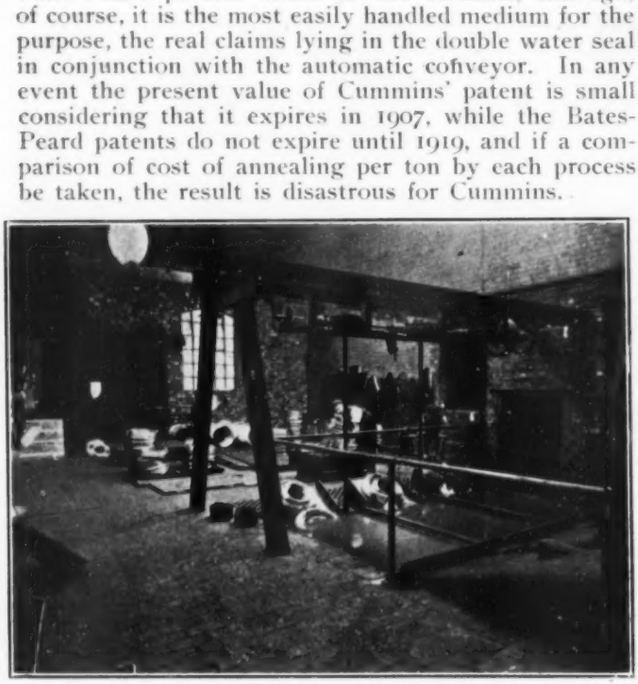


FIG. 4.—DISCHARGING END OF FURNACE.

In order to indicate that our furnaces are in actual operation and successful we herewith show some photographs which show the process being carried out commercially in several large mills. In Fig. 2 is shown the general view of a large furnace which has been giving an output of 50 tons of annealed copper wire per day for a period of 18 months past. In Fig. 3 is shown a more detailed photograph of the loading end of this furnace. Stacks of hard, unannealed copper may be seen deposited behind this furnace. One man can keep this furnace loaded to get the desired output; he merely has to start the coils down a tin shute, which lands the coils to be annealed on the traveling chain, which is revolving under the water in the tanks. In Fig. 4 is the unloading or discharge end of the same furnace. Here you see the coils coming out of the water and being dropped on the floor, when they are picked up by two men whose duty it is to gauge the wire, tighten up the ties, label the wire and stack it ready for export. One of these men does the stoking of the furnace.

It will be seen, therefore, that this furnace, capable of working 50 tons per day can be worked by three men on a shift; furnaces of this design have been erected in England and in Germany.

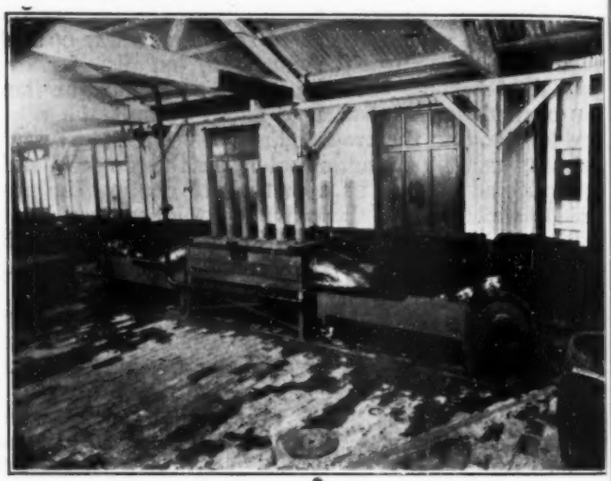


FIG. 5.—GAS FURNACE.

Fig. 5 is a reproduction of a photograph of a small self-contained furnace fired entirely by gas. The output of this furnace is 1½ tons per day of 10 hours. It was built for a firm of phosphor-bronze and brass wire makers, to be used in the manufacture of wire for the wire cloth trade.

PROPERTIES OF COPPER WIRE.

In a paper read before the American Institute Electrical Engineers, Lawrence Addicks, of the Raritan Copper Works, makes the following statements about copper wire, viz.:

1. The tensile strength varies almost directly as the reduction of area.
2. The conductivity drops about 0.10 per cent. for every 1,300 lbs. gain intensile strength, a fact that must be taken into account when comparing samples of hard drawn copper wire.
3. The effect of annealing appears to be independent of the electrical conductivity of the wire.
4. The effect of stranding is to increase the resistance about 3 per cent.

The Canadian Commissioner of Crown lands reports that the production of nickel in Ontario last year exceeded that of any previous year. The total was 6,98 tons, valued at $2,499,698.

MAKING BRONZE CASTINGS FOR EMBOSSING DIES.

The manufacture of bronze dies is a matter which is now receiving much attention, and any matter which will add to our knowledge will be read with interest. A writer in the *American Machinist*, who says that he is a brass founder of some twenty-five years' experience, makes the following remarks: The work I refer to is the making of plates used for embossing the material known as "Lincrusta Walton." These were cast from the plaster model, and they range from 30 to 200 lbs. in weight. The sand I use is what is known as No. 0 Albany. For facing I use one-third of Brooklyn sand, dried and pulverized, and put through a No. 60 sieve, and two-thirds of the Albany tub sand. Mixing the two thoroughly together, I put the whole through a No. 24 sieve and wet it with water in which I had dissolved a handful of salt. For double facing, or printing back, I used the Brooklyn thoroughly dried and shaken through a heavy Canton flannel bag. The parting material I use is known to the trade as prepared charcoal.

The patterns, being plaster casts, were a great deal thicker than the casting was to be, the thickness of the casting being determnied by the depth of the embossing, which in some places was 1¼ inches. I got with a depth gauge of depth of the deepest part of the figure and then added ¼ of an inch to the gauge and made a mark all around the sides of the plaster cast. I then rammed up the plain side and imbedded the plaster face uppermost to a mark I had made around the side. This gave me the pattern raised above the surface of the mold to a height of a quarter of an inch more than the deepest part of the pattern. I then placed the nowel on and rammed it up by treading with the feet. I lifted the nowel off as I would the cope, sprayed it very lightly with plain water, dusted on the facing, then the charcoal, and placed it back. I loosened up the sand to a depth of an inch or so, put some more sand on and rammed it again, then took the nowel off and put it in front of the drying stove until the face was dried to a depth of about an inch, then I took it down, placed it on a couple of rests face down, and smoked it with a torch made of waste and resin. The cope was just a plain side rammed on a smooth board and well vented.

The metal used was good bronze, and poured, when by pushing the surface back with a skimmer, no spelter smoke could be seen rising from it. Those castings left the sand absolutely clean and were put into the machine they were made for without any manipulation.

I have tried the molasses water, both for wetting the facing and for spraying, but never had the satisfaction of seeing the castings so clean as when molded in the way here described.

What is supposed to be the largest amount of wire ever drawn by one man is done daily at the Worcester works of the American Steel & Wire Company. This man, who is a Finlander, draws 10,000 lbs. of three draft wire per day. The wire is drawn from No. 5 to No. 12. In order to draw the 10,000 lbs. per day he must lift 40,000 lbs. a day, or 200 lbs. each time. The wire rod is lifted on to the reel, the coil is then lifted from the block on to the reel for a second draft. This operation is repeated, and the coil lifted from the block to a barrow.

ALLOYS FOR LOCOMOTIVE OIL CUPS.

The oil cups on a locomotive are subject to great vibration, and unless care is taken in the selection of a proper alloy for such a purpose the result will be that the cups will break off at the stem while in use, and with the annoying consequences accompanying such an occurrence.

The usual difficulty is the addition of an excessive amount of lead, and the production, thereby, of an alloy which lacks the requisite tenacity. The entire absence of lead is scarcely required as the casting is then difficult to machine, but oil cups have been found which contained from eight to ten per cent of lead, and even with the so-called ounce mixture, which contains five per cent. of lead, the result is unsatisfactory. The tin should also be kept low, as hardness is not required.

If red metal is required the following mixture will answer, and has given excellent service:

Copper	85 per cent. or lbs.
Zinc	10 per cent. or lbs.
Tin	3 per cent. or lbs.
Lead	2 per cent. or lbs.

Yellow mixtures are satisfactory and cheap, and the following is one of the best:

Copper	60 per cent. or lbs.
Zinc	38 per cent. or lbs.
Lead	2 per cent. or lbs.
Aluminum	2 oz. to 100 lbs. of metal.

Care should be taken in both these mixtures to keep the lead at the amount given. Both mixtures will machine easily.

MELLOID.

Mercury has been used in certain anti-friction metals in which tin is the principal ingredient. It has only been added in small amounts, however, and its value in such alloys is of doubtful nature. An alloy has been sold on the English market for some time in the form of condenser and other seamless tubing in which mercury is an ingredient, and, as far as known, it is the first instance where mercury has been employed in useful copper alloys.

The alloy contains about 3 per cent. of tin and may be worked hot or cold, and it is stated that the addition of the small quantity renders the alloy workable in the hot and cold state alike. The mercury is added in the form of an alloy of mercury and tin previously made up. The alloy of tin and mercury is made up so that it contains four per cent. of mercury and it is used instead of pure tin. It is stated that an alloy containing four and three-quarters per cent. of tin is the maximum that can be worked hot and cold. The alloy which is used, therefore, has the following composition, viz.:

Copper	97.00 per cent.
Tin	2.88 per cent.
Mercury	.12 per cent.

This mixture, of course, is given on the supposition that an alloy containing 3 per cent. of tin is used, and it is understood that this is the amount that exists in the condenser tubes.

How extensively "Melloid" is used for condenser tubing is not known at present, but it is quite extensively advertised.

An exhibition of mining and hydraulic apparatus, open to all countries, will be held at Barcelona, Spain, in September and during the following months of this year.

EFFECT OF IMPURITIES ON COPPER.*

Pure copper alloyed with .02 per cent. of lead or bismuth consists of crystals of copper surrounded with a thin skin of lead or bismuth, and is so brittle that it will not roll; in the absence of sub-oxide of copper the presence of .002 per cent. of bismuth is sufficient to make the copper brittle. When .02 per cent. of arsenic, phosphorus, or tin, is added to pure copper the copper crystals are surrounded by a eutectic alloy of the two constituents; the alloy can be rolled hot, and is very malleable; the addition of .02 per cent. of antimony or zinc gives a similar structure, but the alloy rolls very poorly; sub-oxide of copper also gives a similar structure, but up to 1 per cent. may be present without affecting the malleability of the alloy.

The addition of .02 per cent. of iron, manganese, aluminum, or nickel to pure copper does not alter the micro-structure of the metals. Arsenic has the property of neutralizing to a certain extent the injurious effects of bismuth, lead and antimony, but tin, manganese, and aluminum intensify the effect of the impurities. So also manganese and aluminum when present to the extent of 0.5 per cent. are capable of neutralizing the effect of 0.1 per cent. of sulphur. Although quantitative experiments cannot be made so readily, oxygen appears to act in much the same way as arsenic, forming an eutectic alloy in which the impurities remain dissolved, and are thus rendered harmless. From these results it appears that the properties of commercial copper can be largely altered by judicious blending of impurities, and that a given sample may be defective by reason of an excess or a deficiency of foreign elements.

OUR SUPPLY OF NICKEL.

The following comments on the supply of nickel is of interest. They are taken from remarks of U. S. Consul Henry S. Culver, of London, Canada, and indicate the real situation of the nickel question:

For some time past the government of Ontario has had under consideration the question of withdrawing from sale or lease all or part of the known unsold nickel lands in the Province and offering them to the Imperial Government to provide war material for the manufacture of armor plate and British guns. The order in council of November 11 withdrawing a belt of land 10 miles wide on each side of the Temiskaming and Northern Ontario Railway, so as to reserve the minerals, especially the nickel ores, is the first step toward making possible British ownership of the nickel of Ontario.

The nickel supply of the world is at the present time derived from two sources. The most important is the Sudbury district of this Province; the other, in New Caledonia, a French penal settlement or colony situated in the Southern Pacific Ocean, about four days' sail from Sydney, New South Wales. Consequently, among the great powers, France and Great Britain are at present the only ones possessing nickel to any appreciable extent for use in their respective armaments, and in modern armaments nickel is now indispensable and increasingly so. There is reason to believe that if the British imperial authorities fall in with Canada's desire to conserve the nickel of Ontario for imperial uses France will at once take similar steps in regard to the nickel from New Caledonia.

*E. A. Lewis, Engineering, December, 1903.

THE USE OF ZINC FOR ROOFS.

Much more attention is being paid to the material used on roofs than heretofore. Wood shingles, slate, tin, tile, all have bad features. Copper has been used to some extent, and where it can be afforded it is now generally put on, but in addition to its cost it actually corrodes and turns green.

Zinc is a metal which seems to be well suited for roofs, and in cost it is far less than that of copper. The slight corrosion which takes place is only superficial, and does not injure the roof at all nor does it interfere with the lasting qualities. There is no reason why a roof made of zinc should not last as long as one of copper, and time will probably demonstrate such a condition. Zinc may now be obtained in any form desired, and, therefore, may be used as sheet, shingles, or tile, and even painted if desired, although this is scarcely necessary.

It is quite significant that zinc is used on many of the buildings at the St. Louis exposition, and this fact demonstrates that zinc is the coming material for roofs. It is certainly replacing tin to a considerable extent; and if one compares the price with that of good tin plate, it will be readily seen that there is but small difference. It is believed that the next decade will witness the extensive use of zinc for roofing, and that such an outlet will make the largest consumption of this metal in sheet form. The zinc smelters who have rolling mills will not regret it.

A NEW APPLICATION OF ALUMINUM.

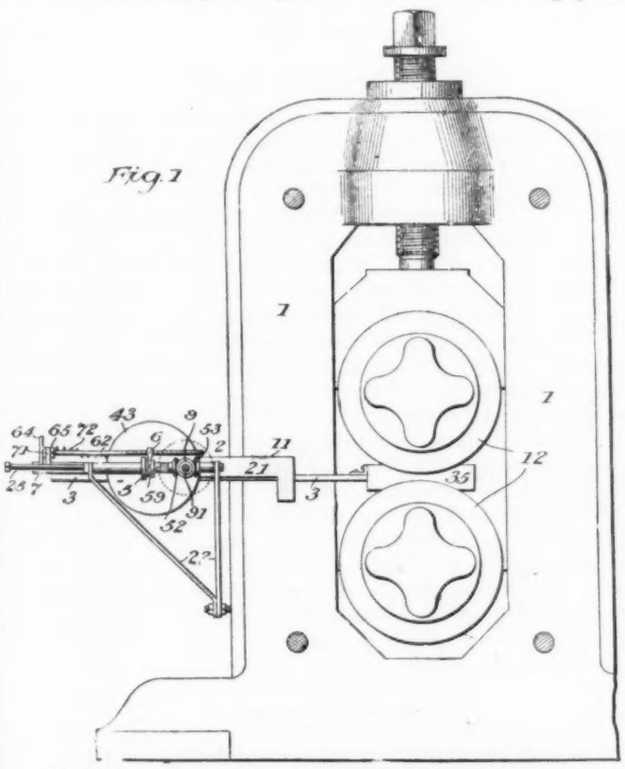
According to *La Métallurgie,* at a recent meeting of the "Société d'Encouragement pour l'Industrie National," an interesting paper was read on the substitution of aluminum for wood in the machinery of spinning mills. In the textile industries—spinning, dyeing, and silk weaving, among others—a wooden bobbin is generally used. This is cheap and easily worked, but it has many drawbacks. Being very hygrometric, it suffers from variations of temperature; this accounts for the fact that in spinning factories where the atmosphere is full of humidity the bobbins revolve irregularly, causing jerks which slacken the speed and occasion the threads to break. The result is waste of stuff and loss of time in joining the threads again. It has been proposed to substitute aluminum for wood. Bobbins made of this metal revolve in any temperature and any degree of humidity; their relative lightness (five aluminum bobbins weigh no more than two wooden ones) allows the machines carrying them to move more quickly, or an equal speed may be obtained at less expense of motive power; finally, the smaller volume of the bobbins diminishes the cost of transport. It was stated that several firms had adopted the use of aluminum bobbins and had found that they possessed many advantages.

It is a mistaken notion that silver is a beneficial ingredient in bell-metal. The name of "Silver Bells" is one of poetry, and not of metallurgy. The idea that silver is present in good bells probably arises from the color and the fact that, in ancient times, this metal was actually introduced into a bell mixture. The addition of the silver was only done from a matter of sentiment. Silver does not harden copper sufficiently to form a good bell-metal mixture.

THE WEBSTER METHOD OF GRINDING BRASS ROLLS

The grinding of a pair of chilled rolls for cold-rolling brass or copper sheet seems, to the layman, to be a simple operation; in reality it is the most difficult problem in the rolling of metals. Chilled rolls as they come from the maker are ground with an excellent surface, but are wholly unfit for rolling brass sheet on account of the absence of the necessary crown. After the rolls have been set up in the housings it is invariably customary to grind the rolls with a hard-wood stick and emery until the requisite crown has been put upon them. This crown is necessary on account of the "spring" of the rolls, and unless this point is well understood and the rolls suitably ground, flat sheet of uniform thickness cannot be produced. The grinding of the rolls is the acme of the brass-roller's art, and those who are able to grind a pair of rolls so that the sheet produced is flat and of uniform gauge are invariably considered the best rollers. Roll grinding is the fundamental part of the roller's trade.

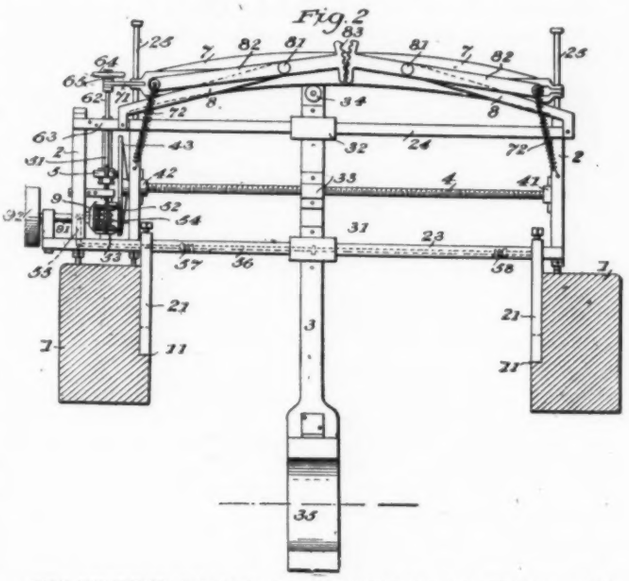
The customary method of grinding a pair of brass rolls is by the use of a hardwood stick and emery. The wood is grooved so as to conform to the shape of the rolls, emery and oil are put on, and the roller moves the stick to and fro until the proper crown has been put on. This operation involves a complete knowledge of roll grinding, and only those who possess this knowledge can grind a pair of rolls successfully. Up to this time nothing has been devised which would supplant the roller and the hardwood stick, but William R. Webster, Jr., Superintendent of the Bridgeport



THE WEBSTER METHOD OF GRINDING BRASS ROLLS—END ELEVATION.

Brass Company, Bridgeport, Conn., has recently invented an appliance* for grinding a pair of brass rolls which is quite novel in its workings. It is the only device known which will do this work successfully; in fact, the only machine ever invented to do this work.

The device is shown in Figs. 1 and 2 and consists of a frame which is attached to the roll housings. In Fig. 1 is shown the end elevation of the device and



THE WEBSTER METHOD OF GRINDING BRASS ROLLS—PLAN.

roll-housing. The actual grinding is done by the grooved stick 35, as this form of grinder has been found to be quite satisfactory. It is attached by means of the bar 3 to the device. In connection with his invention Mr. Webster says: "My invention relates to devices for grinding the rolls used in reducing the thickness of brass, copper, or other metals. Largely by the reason of the variation in the width of the metal handled these rolls are rapidly worn to irregular contours, which necessitates frequent grinding. This has frequently been done by hand, the operator using a chiseled-shape stick in which emery is imbedded. This is held against the adjacent faces and moved from end to end of the rotating rolls. It is clear that the abrasive effect of any particular point on the roll will depend (the pressure being constant) on the duration of the contact—**i. e.**, it will be inversely as the speed at which the stick traverses the roll at this point. Ordinarily the best results in rolling copper and its alloys are obtained by having the rolls in the form of a concave ovoid. In the case of a pair of rolls used for sheet brass, and, say, 16 in. in diameter and 36 in. in length, the diametric difference between the center and the ends of each roll commonly approximates .003 of an inch. It is obviously very difficult to obtain this accuracy by manual operation. The special feature of my invention is the automatic alteraton of the traversing feed of a grinder at any point of its travel over the face of the roll. My device will, therefore, automatically grind such rolls to produce any desired contour."

In Fig. 2 is shown the top plan of the device. The contour bar 7 determines the shape of the roll, and this bar may be made of any shape desired, concave, flat, or convex. The device is driven by the pulley 92, which may be connected by a belt to the roll-wabbler. The apparatus is constructed so that as the center of

*U. S. Patent 761,276. May 31, 1904.

the roll is approached the travel of the wood-block increases so that the grinding is not as prolonged as that which takes place on either end. The traverse speed is the fundamental principle of the device and is accomplishd in a very ingenious manner by means of the bars 82, to which are attached the springs and the friction wheel 43.

The roll grinder is entirely automatic in action and certainly forms one of the marked advances in replacing the rule of thumb methods which have existed in the brass industry in the past.

PICKLE STAINS ON SHEET METALS.

Pickle stains have been one of the perplexing obstacles in the production of sheet metal by the rolling mill, and particularly so when their cause cannot be determined. They appear on the sheet after it has been annealed and pickled and occur in the shape of reddish, irregular spots. In the majority of instances the sheet is not injured by the presence of pickle stains, but the consumer is somewhat dubious about the quality of the material when they appear to any extent, and they really are quite unsightly.

When pickle stains occur something must be found which causes them, and as a rule the pickle is assumed to be the reason, but unless pieces of iron or zinc happen to fall into the pickle tub the pickle is not responsible. If coal is used for annealing it is generally assumed that this is responsible on account of the sulphur which exists and, to be sure, it is in some instances, but not in the majority. Some of the worst pickle stains may appear just as readily when wood or oil is used as in the case of coal.

Recent investigations have demonstrated that oil is one of the principal causes of pickle stains, and if one is desirous of eliminating them he should investigate this part of the operation. Certain kinds of mineral oil seems to produce these stains. In order to properly investigate the matter let a sheet be taken and soaked in potash solution so that the grease is removed, then carefully rinsed and annealed. If the stains still appear it will be safe to assume that some other cause be looked for, but it is believed that oil is far more apt to produce pickle stains than the majority of people believe.

If the difficulty is really attributable to the oil it will generally be found that the use of a pure animal oil will obviate it.

By the explosion of a hydraulic valve at The Delta Metal Works, at London, England, a workman was killed. The valve was used on the machine for producing extruded metal, and, it was stated by The Delta Metal Company, that it had been subjected to 36,000,000 shocks in its four years of life. The expert who examined the valve stated that the metal had become fatigued.

It has been discovered that a radio-active gas can be obtained by passing air over melted copper. The same phenomenon takes place when air is drawn through mercury. The emanation itself decays in activity and falls one-half in about three days. Such a discovery leads one to believe that elements exist in copper which have not yet been detected.

We have received from the Working Men's College, of Melbourne, Australia, their annual prospectus showing the work of the institution for the past year. The college has day and evening courses in the arts and sciences, including a course in metallurgy.

BURN YOUR BUFFING WASTE.

All mills in which buffing is done accumulate large quantities of brass buffing waste. This is in the form of a compact mass of rags or cotton wool, containing the metal, rouge, grease, and various similar substances. Such material does not carry enough copper to be salable, as it rarely goes above a few per cent., and such low grade material cannot be sold. If, however, the buffings are burned all the copper remains in the ashes and there results a material which is sufficiently rich to be of some value. By burning the buffing waste, a process of concentration really takes place. The price which can be obtained for the burned material is not high, to be sure, but many concerns have very large amounts of such refuse, and the revenue which can be obtained from it should be worth considering.

The buffings can be burned in any manner. If dry, they will burn themselves, but this, of course, has to be carried out in the yard with its consequent loss by the wind. A muffle is an excellent thing, but is not possessed by all. An old boiler shell, set up on some brick piers and furnished with grate bars is, indeed, an excellent piece of apparatus and can be easily and quickly made. Unskilled labor is all that is required and no fuel. The buffings are self-consuming.

The ashes are barreled and sold to the copper refiners. Ordinary burned rag buffings from brass buffing will go from 15 to 20 per cent. in copper, so that the value is sure although not large. A recent shipment of a carload of this material to a copper smelter showed a copper content of 18.43 per cent.

THE BOILING POINTS OF METALS.

By means of vessels made of quartz, the boiling point of certain metals has been made. The quartz vessels were heated by an electric furnace. The temperature is given in Centigrade.

Zinc sublimes below 300 degrees and at 640 distills fairly quickly. Cadmium boils at 322 degrees and sublimes rapidly at 448. Selenium distills quickly at 380 degrees and tellurium at 550; boiling, in the case of tellurium being perceptible even at 535. Lead boils rapidly and distills at 1,160 degrees. Tin, however, proved to be very refractory, and no distillation occurred even at 1,100 degrees. At 605 degrees antimony sublimes slowly and at 775 to 780 distills rapidly. Bismuth commenced to sublime at 540 degrees, the sublimate assumed the form of drops at 930 and boiled briskly at 1,050 degrees. In the case of silver a slight mirror appeared at 1,090 degrees, and the metal boiled briskly at 1,340 degrees. Copper and gold boil at too high temperatures to be examined even in quartz vessels. With copper, however, a slight sublimate formed at 1,315 degrees, and with gold a little vapor arose at 1,375 degrees, which is near the point at which the quartz vessels melt down.

Westinghouse-Parsons steam turbines are to be installed in the new power station of the Union Metallic Cartridge Company at Bridgeport, Conn. The initial installation will consist of two turbo generating units, each of 500 kw. capacity. The turbines will be operated for general power and lighting purposes in the various shops located within three or four blocks of the power station.

THE LOCAL THICKENING OF ELECTRO-PLATE.

In a spoon or fork the portions which receive the most wear or abrasion are the underside of the bowl and handle, as these parts come in contact with substances more than others. For this reason the plating first wears away at these two points, and the common practice of giving flatware an uniform plate quickly results in such a difficulty. Various means have been

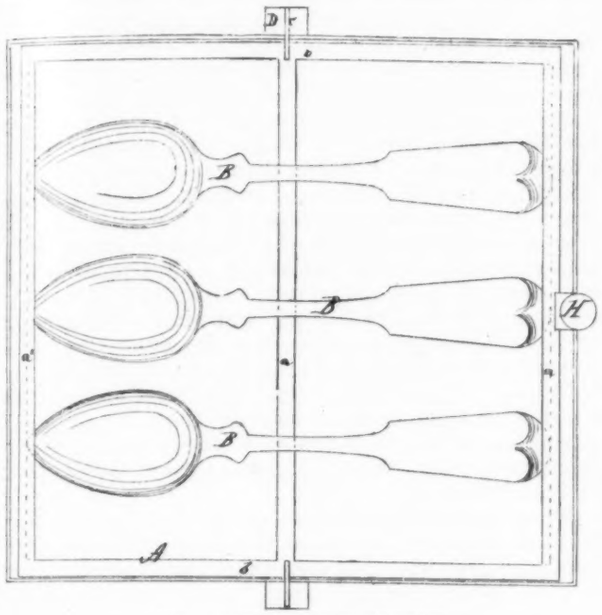


FIG. 1.—FRAME FOR SPOONS.

taken to reinforce these two vulnerable portions and consist in soldering or sweating a piece of sterling or fine silver on the bottom of the bowl and handle. Although this method accomplishes the desired result its cost is greatly against it, and the goods so produced are nearly as expensive as sterling ware.

The method now pursued by the makers of the best grade of plated flatware is to locally plate the bottom of the bowl and handle so that these particular portions will have extra thickness. After these portions have received the primary plate the whole spoon is plated wth the usual electro-plate.

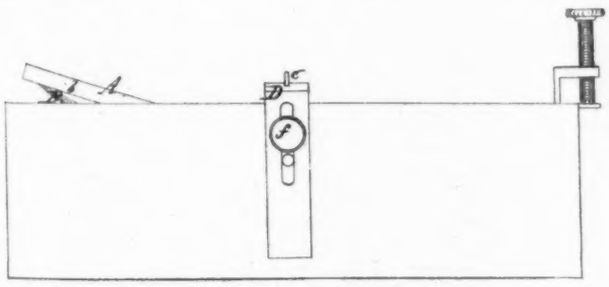


FIG. 2.—SIDE VIEW.

The method of carrying out this operation of locally plating the exposed portion of the article is to have only such portions touch the solution and thereby plate them. In order to do this, however, it becomes necessary to have an appliance for holding the article, otherwise the plate will not deposit uniformly.

The appliance which is generally used is shown in the accompanying cuts. In Fig. 1 is shown a frame over which the spoons are placed and the end held down by means of the thumb screw H. The side view is shown in Fig. 2, and the slide D, with set screw f, allow the spoon to dip into the solution the proper amount. In Fig. 3 the spoon is shown with the bottom of the handle just dipping into the solution.

By changing the position of the spoon end for end

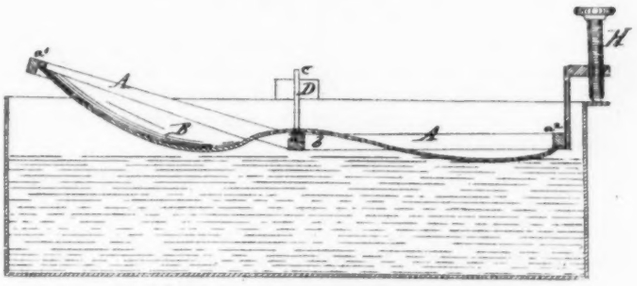


FIG. 3.—HANDLE DIPPING.

the bottom of the bowl may be plated in the same manner. The frame is made of metal and so acts as a good conductor of the current. Although the one shown in the cut holds three articles it may be made to hold as many as desired or so as to reach across the plating vat.

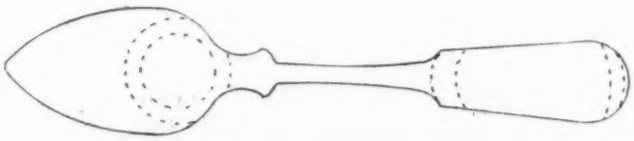


FIG. 4.—REINFORCING.

In Fig. 4 is indicated the process which may be advantageously used in reinforcing the bottom of the bowl and handle. By first allowing the article to dip into the bath, indicated by a small circle, the thickness may be concentrated upon a small spot. Further dipping of the portion in the bath gives increased area, shown by the large circle.

COP-BRONZE.

A finish bearing this not very euphonious name now exists on the market. It is used for finishing wire screen cloth to be used for window screens and is assumed, in the majority of instances, to be solid metal. The finish is really a plate, however, and is applied to brass wire cloth in order to tone down the unpleasant color.

Iron wire cloth is that which is generally employed for making window screens and is very extensively used, but its life is only a few seasons and it then becomes rust-eaten and brittle. Those who desire the lasting qualities of a good screen have used brass wire cloth, but the yellow color is not pleasing and the spots from corrosion which invariably form are quite conspicuous and unsightly. In order to obviate all these unsatisfactory conditions an enterprising firm plates the brass wire cloth with a bronze plate and has applied the name of "Cop-Bronze" to it.

The screen cloth is plated in a bath composed of 30 lbs. of sulphate of copper; 1½ ounces of cautic potash; 10 lbs. of sulphate of zinc; 6 ounces of bi-chloride of tin; 5 lbs. of sal-ammoniac; 8 ounces of chloride of iron. The anode used is composed of 8 lbs. of copper to ¾ lb. of zinc and ¾ lb. tin. The finish is said to be that of a statuary brown and the color permanent.

CADMIUM-SILVER ALLOYS FOR PLATING.

The subject of the use of alloys of cadmium and silver as a substitute for silver in electroplating is now receiving more or less atention. Cadmium is white and non-tarnishable, and alloys with silver to form a somewhat hard alloy and possessing a white color. Cadmium itself also possesses a pleasing white color, and although it resembles zinc somewhat in its properties is more nearly like silver in color. The alloys of silver are easily made by simply melting, and the one which is used consists of 60 per cent. of cadmium and 40 per cent. of silver.

S. Cowper-Coles gives the following table as showing the relative hardness of the electro-plate deposited from different metals:

	Hardness.
Nickel electro-plate	10.0
Sheffield plate	10.0
Antimony electro-plate	9.0
Palladium (deposited bright)	8.0
Palladium electro-plate	6.6
Cadmium-silver alloy (60.5% cadmium, 39.5% silver)	5.0
Cadmium (deposited bright)	4.5
Silver (burnished)	4.0

The hardness was tested by means of a diamond point. The number of grams which it took to produce a scratch being taken as the amount.

The difficulty experienced in working the cadmium-silver alloys is to obtain a good, adherent deposit.

RAPID ELECTRO-DEPOSITION OF COPPER.

At a meeting of the Royal Institution of Great Britain some time ago, Mr. Swan obtained a perfectly coherent deposit of copper by using a current of 1,000 amperes per square foot of cathode. The method employed was as follows, viz.: In a copper nitrate bath containing a small proportion of chloride of ammonium, two copper plates of 140 sq. centimeters each were placed at a distance apart of 25 millimeters. Then a current of 140 amperes was passed through the plates for one minute. At the expiration of this time a solid electrotype of the cathode was obtained, which with the current ordinarily employed would have required more than an hour for its formation.

ORMOLU FINISH CORRECTION.

To the Editor of THE METAL INDUSTRY:

In my article on "The Ormolu Gold Finish" in your June issue typographical errors have made it appear that the matt finish is given to spelter and iron articles which have been brass plated by the usual brass matt or dead dip. Such goods are given the matt surface by electro-deposition only, and the acid matt dip is only employed for solid brass goods. It is practically impossible to deposit sufficient brass on a spelter or iron article to stand the acid treatment. Will you kind call attention to this error, as otherwise the reader of my article might have the wrong impression?

F. P. DAVIS.

Since the beginning of the present year gold to the value of $23,088,565 has been shipped to all countries, a falling off of $5,158,545 for the corresponding period of last year.

JEWELRY MANUFACTURE IN GERMANY.

The following report from U. S. Consul Harris, of Mannheim, Germany, is interesting as indicating the extent of the jewelry manufacture in this country:

A branch of manufacture in which Germany has made notable progress in recent years is that of jewelry and gold and silver ware. The domestic product is not only supplying a large home demand, but is going into all parts of the world, and its manufacture is giving employment to a vast number of workmen and skilled artisans.

Pre-eminent among the jewelry-manufacturing towns of Germany is the city of Pforzheim, Baden, in a somewhat isolated position at the northern edge of the Black Forest region. It is a city of about 45,000 inhabitants and for more than a century has been noted for its manufacture of jewelry. There are now more than 700 different jewelry factories in the city employing over 20,000 workmen, whose annual earnings aggregate nearly $4,760,000. They produce jewelry amounting to $24,000,000 annually, two-thirds of which is exported to foreign countries. About 12,000 of these workmen reside in the city itself, the others living in the surrounding villages. Many of these factories are small, while others are large, some of the latter giving employment to more than 500 workmen. About 400 of the factories have power plants, mostly electric, operated from the city light and power plant of Pforzheim.

Minor attention has been given thus far at Pforzheim to the manufacture of the finer grades of tableware and jewelry. Some of the firms, however, carry on these branches to a limited extent. Large quantities of diamonds and other precious stones are used by many of the establishments.

The specialties of most of the factories are all kinds of low-priced jewelry and novelties of every sort.

It is stated that in a recent meeting of a society of jewelry manufacturers in Paris much stress was placed on the extent to which the German manufacturer is wresting this trade from the French. The editor of a leading French jewelry journal pointed out in an address that for the past twenty years the German manufacturers in this branch of industry have made astounding progress and that they have had their designers in the art galleries and libraries of Paris and elsewhere copying artistic designs to be used in the manufacture of jewelry.

In considering the development of this industry in this part of Germany, account is also to be taken of the abundance of labor and correspondingly low rate of wages. The proportion of hand work required is large and is sufficiently varied to afford employment to entire families—in fact, to entire villages.

Shipments to the United States of the goods manufactured at Pforzheim are not large. Undoubtedly the manufacturer would assign customs duties as the chief obstacle in the way of a valuable trade in that direction. Shipments of German jewelry to France now amount to about $1,750,000 in value yearly.

Doctor Hannel, superintendent of mines for Canada, who was sent by the Canadian government to Europe in company with other commissioners to ascertain the economic possibilities of electric smelting of ores, has made a preliminary report to the minister of the interior in which he pronounces the process both economical and easy and urges its adoption in the Dominion.

GALVANIZING SMALL ARTICLES.*

An improved method of galvanizing small articles, such as nails, screws, tacks, rivets, washers, etc., is now being brought to the attention of manufacturers. This apparatus, it is claimed, will be the means of placing on the market a number of galvanized goods which are not now carried in stock.

In the old method of galvanizing, the articles are placed in perforated dippers or baskets, dipped into a tank of molten zinc, left there till brought to the same temperature as the zinc, then taken out and shaken into an inclined chute leading to a water tank, leaving a large quantity of surplus metal adhering to the articles. The contact with water makes them very rough, and often, in the case of small articles, a large percentage of them will remain stuck together in bunches. The articles when taken out of the water are sifted in sawdust to dry them and the bunches of stuck articles are picked out. By this method it is almost an impossibility to produce a satisfactory galvanized wood screw, for the reason that the slot and the thread are filled up with surplus metal. Washers are also difficult to galvanize, owing to the large amount of flat surface on them and the liability of them sticking together. The water cooling also has a bad effect on the metal of which the articles are manufactured.

By the Porter method, as described by the inventor, the articles, after being dipped in the molten zinc, are thrown into the hopper of a machine which does the rest. It handles anything from a small tack to a 60-penny nail at the rate of from 2,000 to 3,000 pounds per hour, and a boy can run it. It removes all unnecessary surplus metal, cools without coming in contact with water and delivers the articles into kegs or boxes ready for shipment with one operation. Its work is done so quickly that it allows the galvanizer to use his metal at a lower degree of temperature, and hence a less amount of dross is produced and the life of the metal tank is prolonged. The cooling process is so gradual that the temper of the metal is not affected, leaving it in its original soft and malleable condition. The advantage of such a process on such articles as clinch or boat nails and rivets can easily be seen. On screws the zinc is so evenly distributed that the thread and slot in the head are left perfect.

This process, it is claimed, will cheapen wire nail galvanizing to such an extent that all wire nails can be galvanized. The galvanizing of nails will greatly increase their holding power, at the same time making them absolutely rust proof, so that they can be shipped to any part of the world or kept in stock for any length of time without fear of becoming rusty or damaged by dampness.

This apparatus is not a matter of experiment, one of the machines having been in practical operation for some time in the Porter Metal Works, San Francisco. The process was invented by George Porter.

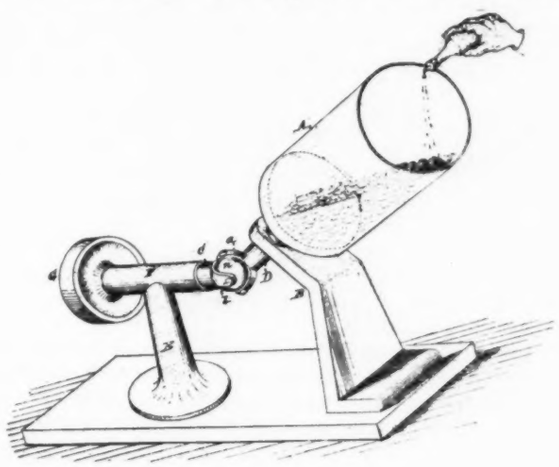
Articles of sheet zinc may be readily and satisfactorily annealed in hot oil. The oil is heated to the proper temperature which may be easily gauged by a thermometer and the zinc articles placed in it. The oil serves a two-fold purpose; it answers for annealing the articles and likewise for lubricating them when they are again drawn or spun.

*From *The Metal Worker, Plumber and Steam Fitter.*

JAPANNING EYELETS OR SMALL ARTICLES.

In the manufacture of eyelets, buttons, or similar goods it is often necessary to japan them in order to impart the proper black color. One method has been to dip them, while in a basket, into japan, allow the surplus amount to drain off and then bake them. This method is not satisfactory with small articles, as a surplus of the japan will invariably remain on the articles, particularly where the portions touch one another. This method can be replaced with one which gives far more uniform results.

A simple tumbling barrel is all that is required and one which is capable of being tilted is to be preferred.



JAPANNING EYELETS.

The tumbling barrel and method of using is shown in the sketch. The eyelets or other articles are placed in the barrel and the whole is set in motion. When the barrel begins to revolve the japan is applied from a bottle, can, or other receptacle, and is showered on in small portions so that there is just sufficient of it to put on to coat the articles. An excess is to be avoided. The barrel is now revolved for a short time until the articles are evenly and completely coated. The barrel is then tilted, the articles dumped out, placed in the oven, and baked. By this means the excess of japan is avoided and the consequent adherence of the articles with the accompanying "lumpy" appearance.

Gold is particularly susceptible to impurities and even almost infinitesimal amounts of foreign metals will render it brittle. Even a few thousandths of a per cent. of tellurium causes it to crack in rolling. Bismuth and antimony also act in the same manner. These impurities may be removed by nitreing the gold well while being melted so that they become oxidized out and go into the slag. Nitre will usually render the most brittle gold tenacious if allowed to act sufficiently long.

Mr. John H. Allen and brother, of the firm of Barker & Allen, Limited, German silver manufacturers of Birmingham, England, recently made a trip to the United States, visiting the various rolling mills and cutting up shops and the manufacturers of metal working machinery.

Copies of THE METAL INDUSTRY will be found at the Louisiana Purchase Exposition, St. Louis, in the library of the Palaces of Mines and Metallurgy and in the Foundry Building.

CORRESPONDENCE DEPARTMENT

In this Department we will answer questions relating to the non-ferrous metals and alloys. Address THE METAL INDUSTRY, 61 Beekman St., New York

Q.—A firm of foundrymen say that they have some orders for German silver castings but have not been successful in making them. The castings have pin-holes in them and they have not been able to make any work which does not have them.

A.—German silver cannot be cast in sand in a manner that is at all satisfactory without the use of aluminum. The aluminum not only removes the pin-holes but makes the metal run freely and to the extreme corners of the casting. German silver scrap may be used or a mixture of copper, 60 per cent.; zinc, 20 per cent.; nickel, 20 per cent. Whether scrap or new metal is used add 2 ounces of aluminum to 100 lbs. of metal. If small castings are to be poured, this mixture should be poured so that a small spelter flame plays over to top of the metal, gently but not fiercely. If poured too hot, the castings will be poor. Castings of a somewhat thick nature may be poured at a temperature so that no spelter smoke comes from the metal unless stirred with the skimmer. The best results are always obtained by pouring at as low a temperature as possible.

If the mixture is not stiff enough more aluminum may be added up to 3 per cent., when the alloy becomes hard and almost brittle but very stiff. This is the alloy used for typewriter parts. Strange to say, German silver with aluminum in it is better after it has been melted once.

Q.—A subscriber desires a method of japanning small zinc articles so that they will stand the weather.

A.—If the articles are japanned in the usual manner and with a good quality of japan and then baked, they will stand the weather ail right. There is no reason why japanned zinc should not stand as well as any other metal.

Q.—A plater who has been doing copper plating has had trouble with his solution. The solution was made from commercial carbonate of copper, about 6 ounces to the gallon. The carbonate was dissolved in cyanide of potash solution until clear and a little excess added for free cyanide. After each day's work, I added a little cyanide. The solution worked all right for a few days, and then the work gradually began to grow dark and finally almost black, with good colored edges on the articles. The work would have a sufficient deposit but not of good color. The addition of carbonate of copper or cyanide made no difference; the work still remained dark. By touching the work to the anode while working, the dark color disappeared. He wishes to know where his difficulty is.

A.—The first mistake was made in the use of commercial carbonate. The additions of cyanide and copper beyond the proper amount has apparently increased the density of the solution beyond the dynamo capacity. This is to be inferred from the fact that the parts of the work nearest the anodes—i. e., those getting the most current—are all right. We suggest that the solution be warmed to about 100 to 110 degrees F. or the current materially increased, or both. Arsenic brightens the copper deposit in the same manner that it does brass. Dissolve a small amount of white arsenic in cyanide solution and add to the bath in small portions at a time until the proper effect has been produced.

Q.—A brass founder writes that he has had some difficulties in making a yellow brass mixture which will turn freely. The mixture which was used contained 2 parts of copper to 1 of zinc, with ¼ ounce tin to 1 pound of copper and 1 ounce of lead to 1 pound of copper. He also wishes to know what effect antimony will have on the brass or whether phosphor-tin will benefit it.

A.—Your mixture, unless a mistake was made in weighing, should cut freely; in fact, mixtures almost identical with but containing only half as much lead are in daily use for free turning. You will probably find that some error has been made in weighing. Probably too much tin or spelter has been used. Antimony should never be added to brass or bronze mixtures, as it not only fails to produce any benefit, but is actually injurious on account of making the castings weak and liable to crack. A little phospor-tin, say 2 ounces to 100 pounds of metal, is useful in producing sound castings. For dipping, a mixture containing as much lead as yours is not satisfactory. Not over 3 pounds to the hundred should be present.

Q.—A mixture for a non-shrinkable alloy is desired, suitable for making patterns in which allowance has not been made in the master pattern.

A.—A good alloy for this purpose consists of 85 parts of lead and 15 parts of antimony. This alloy has the property of slightly expanding on cooling. If too brittle a little less antimony may be used.

Q.—Information is desired in regard to etching on brass and whether a rubber stamp can be used for this purpose.

A.—Etching on brass, copper or other metals of a similar nature is done as follows, viz.: A mixture of White wax, 1 part; Mastic, 1 part; and Asphaltum, 1 part, is made by melting together. The brass plate is heated and the mixture spread over it. When cool the design is traced and etched. The etching acid consists of 10 parts of strong nitric acid and 70 parts of water, to which a solution of 2 parts of chlorate of potash in 20 parts of water is added. The solution is used cold. The wax mixture may be applied with a rubber stamp in the same manner as ink.

Q.—A plater asks us for an acid solution for stripping silver from brass work. He also wishes to know how to make up a new brass plating solution.

A.—A good silver stripping solution is made of 1 part of nitric acid to 10 parts of sulphuric acid. The sulphuric acid should be poured into the nitric acid. This solution acts on silver but not on brass at all rapidly. It should be used warm. No water should be added or moisture be present on the articles, as if such is the case the brass will be attacked.

For the making of the brass plating solution, see THE METAL INDUSTRY February, 1904, on "Brass Plating." Directions are given in this article for making up the bath.

Q.—A plater asks for a formula for a gold dip solution to be used without a battery.

A.—This process may be carried out by what is known as "water-gilding"—i. e., a solution used without a battery. The process is as follows, viz.: Dissolve 6 pennyweights of gold in a mixture of nitric and muriatic acids and convert into cloride in the usual manner by evaporation and taking up in water. Add to the dry or moist chloride 1 quart of water and then add 1 pound of bi-carbonate of potash. Boil for two hours. The articles to be gilded are cleaned in the usual manner and dipped into this solution while boiling for a period of from a few seconds up to one minute, depending upon the condition. This solution only answers for brass or copper. For gilding silver dissolve equal parts of corrosive sublimate and sal-ammoniac in nitric acid and add some grain gold and evaporate to one-half the bulk. Apply while hot to the silver article.

Q.—A plater who has occasion to plate large numbers of small brass articles desires a method of obviating the coloring after they have been plated. He states that he has tried bi-sulphide of carbon, boracic acid, and other materials without success.

A.—The production of a bright nickel deposit depends upon two things, viz.: 1. The production of a bright surface on the work before it is plated; an article with a rough surface cannot be made to come out of the bath with a bright one. 2. The maintenance of the bath in a proper working condition. Some platers who do bright nickeling do not use boracic acid in the bath, but some of the most satisfactory work which we have seen came out of a bath made slightly acid to test paper with boracic acid.

First see that your articles are given a polished surface before plating. Then look to the proper working of your bath. There may be something which is not working properly. We advise the use of the boracic acid, as the work does not discolor when it is removed from the bath. If your nickel bath is in good working condition and with plenty of anode surface we believe that you should obtain as bright a coating as is possible. There is no addition beyond the introduction of boracic acid which can be recommended. See article in THE METAL INDUSTRY, February, 1904, on the preparation of work for the nickel bath.

HENRY H. HENDRICKS.

A sudden death of a prominent metal man was that of Henry H. Hendricks, who died of heart disease on May 27 in the waiting room of the Christopher street ferry, New York, where he had gone to meet his daughter. Mr. Hendricks was a member of the old metal house of Hendricks Brothers, 49 Cliff street, New York city. The firm owns and operates the Belleville Copper Mills, and are the oldest metal house in the United States, having been founded in 1764. Mr. Hendricks was 44 years old and the great-great grandson of the founder, Uriah Hendricks. He was born in New York city, and entered the family business on graduating from Columbia College. He was a member of the New York Chamber of Commerce, the Merchants' Association, Engineers' Club, the New York Yacht Club, the American Association for the Advancement of Science and several other societies and social organizations.

YALE & TOWNE'S CHAIN BLOCKS AT ST. LOUIS.

The Yale & Towne Mfg. Co. of Stamford, Conn., have on exhibition at the St. Louis Exposition a complete line of their chain blocks ranging from the ⅛-ton block to one capable of lifting 20 tons. An interesting part of their exhibit is the blocks which are driven by electric motors to indicate their relative efficiency. Instruments to measure the load are connected with the blocks so that it may be readily seen how rapidly a given load may be raised and lowered. The mechanism which has been installed to show the working of these blocks is very ingenious and is constructed so that when the weight reaches the top, the block automatically reverses and lowers the load.

The chain blocks of Yale & Towne are widely used in the brass foundry and form a very satisfactory appliance. There are few brass foundries which can afford a traveling crane, but heavy crucibles or castings must occasionally be made, and the chain block will do the work of a crane at a comparatively low cost. It is a noteworthy fact that the Yale & Towne blocks were used throughout the construction of the exposition buildings for lifting all heavy loads.

THE FOUNDRYMEN'S CONVENTION.

Dr. Richard Moldenke, secretary-treasurer of the American Foundrymen's Association, reports that the recent convention of the foundrymen at Indianapolis and St. Louis was a highly successful affair. Great interest was taken in the subjects relating to shop routine, the apprentice question, insuring patterns, standardizing foundry coke, the fan and blower question for the cupola, the getting together of pattern making foremen and the office accountants, etc. Dr. Moldenke also reports that the half hundred copies of THE METAL INDUSTRY which were placed on the literature table for distribution were all gone in ten minutes, the members showing great interest in the publication. Much of the other trade journal literature was left on the tables.

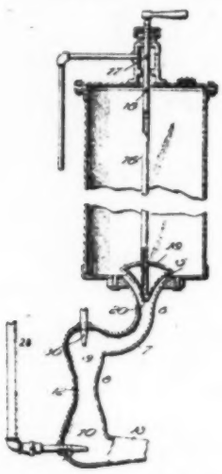
CRUCIBLE SIZES.

Since the publication of the editorial in the February number of THE METAL INDUSTRY on "Crucible Sizes," the manufacturers of crucibles have shown an inclination to hold a meeting and see if they could not agree on uniformity in crucibles. It is generally admitted that it would be better for the maker and user if all of the manufacturers produced a standard sized crucible, and the only obstacle to the accomplishment of this end seems to be the trade jealousy which is generally found in all lines of industry. Several of the crucible makers have, however, signified their willingness to attend a conference. They recognize how other industries have adopted standard sizes of various manufactured products and how beneficial it has proven. They, therefore, believe that it would be to the advantage of the crucible men to standardize their products even if they lost the opportunity of juggling the sizes for the sake of getting orders. They, at least, would not have to sell a smelting pot which would hold many more pounds of metal than its number indicated. At any rate they are ready to talk over the subject, and as the summer season of quiet trade is now upon us, THE METAL INDUSTRY suggests that it is an opportune time for the crucible manufacturers to get together and see what can be done.

PATENTS

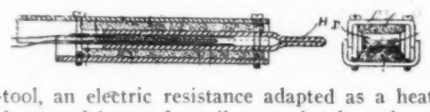
A full copy of any Patent mentioned will be furnished for Ten Cents. Address THE METAL INDUSTRY, 61 Beekman Street, New York

758,118. April 26, 1904. SAND-BLAST.—Francis Sticker, New York, N. Y. In a sand-blast, a sand receptacle, a pipe leading therefrom having a mixing-chamber, an air-supply leading to



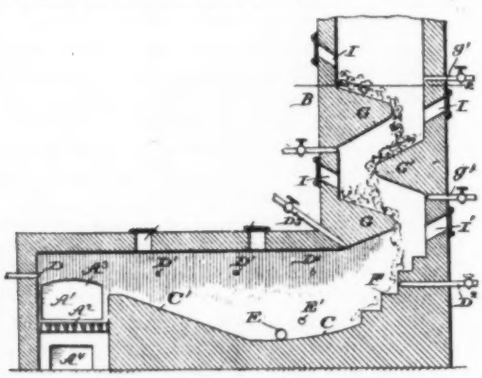
said receptacle and chamber, and means for controlling said supply whereby it may be directed only to the receptacle, or to the receptacle and such chamber.

759,426. May 10, 1904. ELECTRIC SOLDERING-IRON.—Sydney Evershed, London, England, assignor to himself and Evershed & Vignoles, Limited, London, England, a corporation of Great Britain and Ireland. In combination, in an electrically-heated



soldering-tool, an electric resistance adapted as a heater; a metallic conductor of heat, of small mass, in close thermal contact with the heater, adapted as a carrier of heat to a bit, and a tinned piece of metal connected with the carrier, adapted to melt and apply the solder.

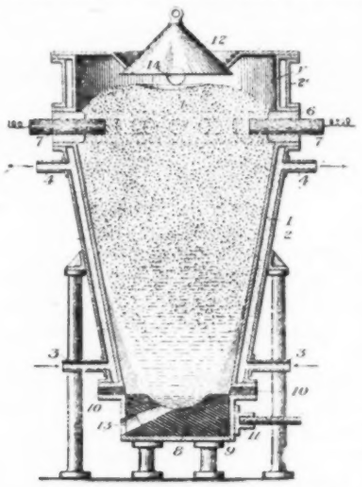
759,791. May 10, 1904. METALLURGICAL FURNACE.—Edwin C. Wills, Altoona, Pa. The combination in a metallurgical furnace of the body or main section having at one end a series of steps, and a preheater above the same and provided with the opposite



inwardly-extending staggered projections, the lower one of which discharges to the steps, and the oil-burners operating upon the material supplied to the said steps and staggered projections substantially as set forth.

759,493. May 10, 1904. METHOD OF RECOVERING METALS FROM SOLUTIONS.—Isaac Anderson, Prescott, Ariz., assignor of one-half to Michael Scanlan, Whitehills, Ariz. The method of recovering gold and silver from solutions containing iron or copper, consisting in treating the solution with lime and subjecting it to thorough agitation.

760,057. May 17, 1904. PROCESS OF ELECTRICALLY SMELTING MATERIALS.—Alfred H. Cowles, Cleveland, Ohio. The process of smelting reducible materials which are normally poor conductors of electricity, but whose conductivity increases with their temperature, which consists in supporting a solid charge of the



material and a reducing agent in an electric furnace having a casing of electrically-conductive material, electrically heating the solid charge to the required temperature, and cooling those portions of the charge adjacent to the inner face of the furnace-casing to an extent sufficient to prevent any substantial shunting of the electric current through the casing, as set forth.

760,406. May 17, 1904. WIRE-STRAIGHTENER.—John A. Gregersen, Chicago, Ill., assignor of one-half to F. J. Kuhlman, Chicago Ill. In a wire-straightener, as a means for operating directly upon the wire for straightening it, a group of three longitudinally concave rolls journaled obliquely to each other and to the axis

of the group, and means for holding them yieldingly inward toward such axis, their concave curvature in axial section being such with relation to their obliquity to said axis that they are adapted to be successively in contact throughout their entire operative length, and means for causing them to rotate all in the same direction about their respective axis when the wire to be straightened is introduced between them.

758,325. April 26, 1904. MANUFACTURE OF ENAMELED WARE.—Thomas M. Lunan, Newark, N. J., assignor to The Central Stamping Company, of New York, a corporation of New York. The herein-described process of enameling, which consists in coating the cleaned article with an enamel carrying metallic bodies and acid in character, then applying to said enameled surface a non-metallic hydroxide, and finally heating to flux and set the enamel.

TRADE NEWS

When You Have Any Trade News of Interest Send It to THE METAL INDUSTRY, 61 Beekman Street, New York.

In about a year the Waltham Clock Company, Waltham, Mass., expect to put up a new four-story building.

Kendall & Flick, of Washington, D. C., are issuing a pamphlet relating to researches in alloys of manganese and copper.

"Great Lakes Compressors" is the title of a catalogue issued by the Great Lakes Engineering Works, of Detroit, Mich.

The Husey Mower Company have recently finished a complete modern plant, including a brass foundry, at Knightstown, Ind.

The L. Hilb Smelting & Refining Works, of Cincinnati, recently destroyed by fire, are again in running order and doing business.

The Muller Art Plating Works have moved from 118 Walker street to 241 Centre street, New York, where they will have a larger shop.

The F. B. Shuster Company, of New Haven, Conn., is putting on the market an automatic machine for forming wire into large shapes.

The new foundry of P. E. Kennehan, Brashier Falls, N. Y., is completed, and he has entirely recovered from the recent visitation of fire.

Ding's Electro-Magnetic Separator Company, of Milwaukee, Wis., report a satisfactory business for the first six months of the present year.

Owing to the accumulation of a large stock of product, the Newark plant of the New Jersey Zinc Company have temporarily suspended operations.

The extensive line of brass goods made by the Wolverine Brass Works, Grand Rapids, Mich., is show in their catalogue C and Σ, containing 175 pages.

Murphy & Schultz, Brass Founders, have moved their business to 175 Kent avenue, Brooklyn, N. Y., and are equipped for light and heavy work of all kinds.

The only strong aluminum chain is said to be manufactured by the Bridgeport Chain Company, Bridgeport, Conn., who turn out ten miles of chain per day.

The Williams Gauge Company, of Pittsburg, Pa., who make their own castings in brass and iron, have issued a circular on their water and steam specialties.

The Hanson & Van Winkle Company, of Newark, N. J., Chicago and New York, have always in stock ready for immediate shipment everything the plater needs.

The metal house of Dickerson, Van Dusen & Co. is now established at their new quarters at 32 Cliff street, New York city, where they occupy a four-story building.

Landers, Frary & Clark, New Britain, Conn., have issued catalogue No. 23, showing their plumbers' brass goods and hardware, of which they manufacture a great variety.

Kruecke Brass Manufacturing Company, of Milwaukee, Wis., is contemplating additions to their building and equipment, in order to accommodate their increasing business.

The plant formerly occupied by the Birmingham Brass Company, Shelton, Conn., has been bought by the Dairy Machinery & Construction Company, formerly of Rome, N. Y.

"Plumbing in Shanty-Town" is the title of a hanger issued by the Glauber Brass Manufacturing Company, of Cleveland, Ohio, on which is pictured in colors plumbing life in the shanties.

The Consolidated Buckle and Metal Goods Company, 83 Crosby street, New York City, are manufacturing chains in steel, brass and aluminum, all sizes, for use of manufacturers of metal goods.

The firm of P. McLaughlin's Sons have been incorporated with a capital of $25,000, all paid in. They are dealers, smelters and refiners of metals at 230 North Twelfth street, Brooklyn, N. Y.

The Toledo Metal Fixture Company, Toledo, Ohio, have been chartered with a capital stock of $10,000 to manufacture sheet metal goods. The company own a four-story factory building on South St. Clair street.

A new aluminum solder has been put on the market by the Niagara Solder and Alloys Company, of 52 Niagara street, Buffalo, N. Y. The company also manufacture solder for pattern makers and brass workers.

A new corporation of Kansas City, Mo., is the Western Knife Manufacturing Company, with a capital of $20,000. R. M. Clark is president; M. B. Freshman, vice-president and manager, and A. M. Clark, secretary and treasurer.

The Niagara Falls Machine and Foundry Company, Limited, Niagara Falls, Canada, have increased their capital stock to $50,000 for the purpose of enlarging their plant. Besides machine work, they produce iron and brass castings.

The Victor Talking Machine Company, Camden, N. J., have recently bought ground for the erection of a building about 70x150, three stories, concrete fireproof construction. The company's old shops were recently destroyed by fire.

The second annual report of the International Nickel Company, of New York, for the fiscal year ended March 31, 1904, shows net profits for the fiscal year, after deducting expenses, depreciation, reserve and bond interest, of $341,102.

The Metropolitan Aluminum Manufacturing Company are now settled in their new shop, 182 West Houston street, New York, where they have 7,000 square feet of floor space and employ forty hands. They manufacture a general line of aluminum goods.

E. M. Lang Company, Portland, Me., are building a new factory for manufacturing all kinds of solder, especially canners' solder. When finished the company say there will be no better equipped factory in the United States for producing solder specialties.

The American Graphophone Company, of Bridgeport, Conn., have let a contract for two additional floors to their east building. This will increase their floor space 27,000 square feet. The company have also obtained bids for a foundry, but have not yet decided to build.

J. P. Lavigne, general superintendent of the Detroit Lubricator Company, Detroit, Mich., has invented a universal screw machine or turret lathe. To exploit it Mr. Lavigne is now forming a company. The machine is suitable for working brass rod as well as steel or cast pieces.

The Cincinnati Metal Company have recently been incorporated with the following officers: Arthur E. Jones, president; H. W. Wayne, vice-president; Malcolm McAvoy, secretary. They are located at Fifth street, west of Elm, Cincinnati, Ohio, and are prepared to furnish metals and alloys of all sorts.

"Two Stories of Zinc" is the title of an attractive pamphlet issued by the Lanyon Zinc Company describing the method of

manufacture of spelter and sheet zinc. It also contains a map of the United States zinc mining camps and the locations of towns or cities in which are located zinc smelters or oxide works.

The Joseph Dixon Crucible Company, Jersey City, N. J., have been compelled to enlarge their branch establishment at 1020 Arch street, Philadelphia. This branch was only established a few years ago. The business has increased to such an extent that it now requires a large building and employs a considerable staff.

The "Royal Drying Material," manufactured by John Sommer's Son, of Newark, N. J., is a superior plater's material for drying out. By using the "Royal" there is no danger of spoiling the work, as is the case when cheap sawdust is bought from saw mills and other sources, which sawdust, as a rule, contains resin and pitch, which will spoil the work.

The Metallurgical Company of America, 52 Broadway, New York, have been incorporated with a capital stock of $1,000,000 for the purpose of doing a metallurgical business, details of which are not yet obtainable. The officers and directors are: Walter Merton, president; L. Seeger, secretary; F. Meyer, treasurer; B. Hochschild, J. Langeloth and Louis J. Magee.

The Standard Babbitt & Metal Company, of Chicago, Ill., have changed their name to the Diamond Anti-Friction Metal Company. Mr. Geo. S. Hunt, who was the founder and president of the old Diamond Anti-Friction Metal Company, is now president of the reorganized corporation. Mr. Hunt has had an experience of forty years in the manufacture of babbitt metal.

The Waterbury Clock Company, Waterbury, Conn., have the foundations completed for a new building 42 x 114 feet, five stories, which will be used for general manufacturing purposes. A new compound Corliss engine, direct connected to a 2,600 ampere Crocker-Wheeler generator, has been installed; also two 250 H. P. boilers made by the Stirling Company, Chicago, Ill.

The S. Obermayer Company, of Cincinnati, O., have recently shipped to Scott Oliver Car Company, Knoxville, Tenn., an entire foundry equipment, consisting of six carloads, including cupolas, blowers, ladles, tumbling mills, foundry facings and supplies of all kinds. The Scott-Oliver Foundry and Machine Shops will probably be the largest and best equipped plant south of the Ohio river.

The Rockwell Engineering Company, 26 Cortlandt street, New York, are gratified over the results they have obtained with their oil furnaces. Though this furnace has only been on the market for four months the company have already sold twenty-five of them, with the prospects of many more orders. Firms which have ordered one furnace are satisfied with the results and are placing duplicate orders.

The Buckeye Brass & Iron Works Company, Cleveland, Ohio, which are the successors to the Casler Alton Clark Company, manufacturers of store display fixtures, and the Buckeye Wire and Iron Works, manufacturers of architectural wire work, have been incorporated with a capital stock of $10,000. The incorporators are: M. J. Pelton, J. D. Pelton, W. P. Trinter, F. S. Chamberlain and Stephen F. Cheheyl.

The New Jersey Aluminum Company, N. J., report that they have added many new articles to their already extensive line. The new goods include salt and pepper shakers, napkin rings, ink stands and articles of fancy design for various uses. They also include new advertising novelties and signs. The company's business is steadily growing and they had a better trade in the first quarter of this year than they had in the same quarter of 1903.

The foundry of Andrew N. Peterson, of 372 Greenpoint avenue, Brooklyn, N. Y., has been incorporated under the name of the Brooklyn Foundry Company, with Andrew N. Peterson as president; J. Jansen, treasurer, and J. H. Bennett, secretary. The foundry has had a steady growth since established some twelve years ago and makes a specialty of large bronze castings. It is managed on the co-operative plan, Mr. Peterson having made the heads of the various departments stockholders.

A number of changes have taken place in the American Brass Company of Waterbury. Some time ago different departments were consolidated, and it is now said that this change has not been as successful as anticipated. The separate companies will conduct their own affairs to a certain extent. E. C. Wood, transportation agent, has resigned and other changes are said to be contemplated. The rumor that the purchasing department is to be abolished and that all buying is to be done by the individual companies is not true.

The Niagara Falls Metal Stamping Works, Niagara Falls, N. Y., have been incorporated with a capital of $128,000, the greater part of which has been paid in. They will build a factory in the upper power district of the Falls. Though but a few years old, the corporation have grown so rapidly that it was necessary to enlarge their plant. They make all kinds of sheet metal signs and a number of specialties. The directors of the company are: Reuben C. Eldridge, Herbert M. Eldridge, Evelyn Eldridge, Lois C. Eldridge and Frank A. Dudley.

The Eynon-Evans Manufacturing Company, of Philadelphia, have under way a large addition to their bronze foundry department, which will more than double their floor space and capacity of output. The new foundry will be a two-story brick building of sufficient heavy construction to admit the addition of a third floor should business warrant, and will be equipped with trolley and metal handling machinery and with compressed air for molding machines. When finished the company believe they will have the largest and best equipped jobbing foundry in Philadelphia.

W. D. Berry, formerly president of the Beaver Valley Metal Company, New Brighton, Pa., has let a contract for the construction of a brass foundry at New Brighton, the main building of which will be 71x38 feet and of thorough modern construction. The foundry will have a capacity of 15,000 pounds per day and be capable of turning out castings as large as 6,000 pounds. Besides castings in brass, bronze, copper and aluminum the foundry will produce babbitt, solder and ingot. Mr. Berry has formed a company and will apply for a State charter with $10,000 capital.

The New Canada Brass Rolling Mills, Limited, Toronto, Canada, are expected to be in operation soon. The machinery is now being installed. Managing Director R. E. Menzies, in a recent interview, stated that they were starting with $150,000 capital but expected ultimately to be a million-dollar plant. The works are the first rolling mills in Canada, and the company expect to supply a good portion of the home demand for brass and copper, of which it is stated that $9,000,000 worth in the form of sheet and $3,000,000 worth in the shape of finished articles are imported to Canada each year from the United States.

The Florence Manufacturing Company have now on exhibition at their New York store, No. 621 Broadway, their new line of "Cosmeon" goods, which, as usual, are a very fine display of metal work. The new finishes this year on the aluminum trays and brushes include royal copper, ebony and jeweled, the latter finish being the inlaying of different jewels such as the ruby, peacock, opal, adula and coral on the backs of the brushes. There are also new styles of engraving which are very attractive. The different sets of brushes, combs and mirrors form a striking display and show what can be accomplished in finishing aluminum by expert finishers.

The old metal house of Richards & Co., 60 Union street, Boston, Mass., which was established in 1812, have been appointed sole representatives in New England for the William Cramp & Sons' Ship and Engine Company, of Philadelphia, for the sale of the company's Parsons' manganese bronze and Parsons' white brass. Both the manganese bronze and white brass are used largely by brass founders; the bronze making an ideal alloy for special castings for automobiles, propellor wheels, turbine wheels and other castings requiring a high-grade alloy. The white brass is an anti-friction compound which is used extensively as a bearing metal for high speed machinery of every description. The placing of this agency in the hands of Richards & Company will mean that a large stock of A1 ingots will always be on hand ready for immediate shipment. The firm also has always in stock every metal which the brass founder needs.

Metal Prices, July 6, 1904

METALS

	Price per lb.
TIN—Duty Free.	
Straits of Malaca	26.00
COPPER, PIG, BAR AND INGOT AND OLD COPPER—Duty Free. Manufactured 2½c. per lb.	
Lake	12.75
Electrolytic	12.65
Casting	12.25
SPELTER—Duty 1c. per lb.	
Western	5.00
LEAD—Duty Pigs, Bars and Old 2½c. per lb.; pipe and sheets 2½c. per lb.	
Pig Lead	4.35
ALUMINUM—Duty Crude, 8c. per lb. Plates, sheets, bars and rods 13c. per lb.	
Small lots	37.00
100 lb. lots	35.00
1,000 lb. lots	34.00
Ton lots	33.00
ANTIMONY—Duty ¾c. per lb.	
Cooksons	7.75
Halletts	7.25
Other	6.25
NICKEL—Duty 6c. per lb.	
Large lots	40 to 50
Small lots	50 to 75
BISMUTH—Duty Free	$1.50 to $2.00
PHOSPHORUS—Duty 18c. per lb.	
Large lots	45
Small lots	65 to 75
	Price per oz.
SILVER—Duty Free—Commercial Bars	$0.58½
PLATINUM—Duty Free	19.00
GOLD—Duty Free	20.00
QUICKSILVER—Duty 7c. per lb. Price per Flask.	45.00

Zinc—Duty, Sheet, 2c. per lb.; 600-lb. casks, 6.75c. per lb., open, 7.25c. per lb.

Tobin Bronze—Rods, Unfinished, 19c.

Tobin Bronze—Rods, Finished, 20c.

PRICE FOR ALUMINUM BRONZE INGOTS.

	Per pound.
2½ per cent	19c.
5 per cent	19½c.
7½ per cent	20½c.
10 per cent	21½c.

Manganese Bronze, Ingots	16½c.
Phosphor Bronze, Ingots	15 to 18c.
Silicon-Copper, Ingots	34 to 36c.

OLD METALS

	Buying.	Selling.
Heavy Cut Copper	10.75c.	11.75c.
Copper Wire	10.25c.	11.25c.
Light Copper	9.50c.	10.50c.
Heavy Mach. Comp	9.50c.	10.75c.
Heavy Brass	7.25c.	8.00c.
Light Brass	5.00c.	6.00c.
No. 1 Yellow Brass Turnings	7.00c.	8.00c.
No. 1 Comp. Turnings	8.00c.	9.00c.
Heavy Lead	3.80c.	4.00c.
Zinc Scrap	3.50c.	4.00c.
Scrap Aluminum, sheet, pure	22.00c.	25.00c.
Scrap Aluminum, cast, alloyed	16.00c.	20.00c.
Old Nickel	15.00c.	25.00c.

PRICES OF SHEET COPPER

SIZES OF SHEETS.		96oz. & over 75 lb. sheet 30x60 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x60	32oz. to 64oz. 25 to 50 lb. sheet 30x60	24oz. to 32oz. 18¾ to 25 lb. sheet 30x60	16oz. to 24oz. 12½ to 18¾ lb. sheet 30x60	14oz. and 15oz. 11 to 12½ lb sheet 30x60
		CENTS PER POUND.					
Not wider than 30 ins.	Not longer than 72 ins.	18	19	19	19	19	20
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	19	19	20
	Longer than 96 ins.	18	19	19	19	19	21
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	18	19	19	19	19	21
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	19	19	21
	Longer than 96 ins. Not longer than 120 ins.	18	19	19	19	20	22
	Longer than 120 ins	18	19	19	20	21	
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	18	19	19	20	21	23
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	20	22	24
	Longer than 96 ins. Not longer than 120 ins.	18	19	19	21	23	27
	Longer than 120 ins.	18	19	20	22	25	
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	18	19	19	20	22	25
	Longer than 72 ins. Not longer than 96 ins.	18	19	19	21	23	28
	Longer than 96 ins. Not longer than 120 ins.	18	19	20	22	25	
	Longer than 120 ins	19	20	21	23	27	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 ins.	18	19	20	22	27	
	Longer than 96 ins. Not longer than 120 ins.	18	19	21	24	29	
	Longer than 120 ins.	19	20	22	27		
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	19	20	22	25		
	Longer than 96 ins. Not longer than 120 ins.	20	21	23	26		
	Longer than 120 ins.	21	22	24	28		
Wider than 108 ins.	Not longer than 132 ins.	22	23	25			
	Longer than 132 ins.	23	24	27			

Rolled Round Copper, ⅜ inch diameter or over, 21 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Tinning Sheets, on one side, 2½c. per square foot.

For tinning both sides, double the above price.

For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Metal Prices, July 6, 1904

COPPER BOTTOMS, PITS AND FLATS

Net Cash Prices.

14 oz. to square foot, and heavier, per lb.	23c.
Lighter than 10 oz.	24c.
10 oz. and up to 12 oz.	26c.
12 oz. and up to 14 oz. to square foot, per lb.	29c.

Circles less than 8 in diam., 2c. per lb. additional.
Circles over 13 in. diam., are not classed as Copper Bottoms.
Polished Copper Bottoms and Flats, 1c. per lb. extra.

PRICE LIST FOR ROLL AND SHEET BRASS

Prices are for 100 lbs. or more of sheet metal in one order.
Brown & Sharpe's Gauge the Standard.

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than and including	2 12	12 14	14 16	16 18	18 20	20 22	22 24	24 26	26 28	28 30
To No. 20 inclusive..	.22	.23	.25	.27	.29	.31	.33	.36	.39	.42
Nos. 21, 22, 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37	.40	.43
Nos. 25 and 26.....	.23	.24½	.27	.29	.31	.33	.35	.38	.41	.44
Nos. 27 and 28.....	.23	.25	.28	.30	.32	.34	.36	.39	.42	.45

Add ½ cent per lb. additional for each number thinner than Nos. 28 to 38, inclusive.

Add 7 cents per lb. for sheets cut to particular lengths, not sawed, of proportionate width.

Add for polishing on one side, 40 cents per square foot; on both sides, double this price.

Brazing, Spinning and Spring Brass, 1 cent more than Common High Brass.

Extra Quality Brazing, Spinning and Spring Brass, 2 cents more than Common High Brass.

Low Brass, 4 cents per lb. more than Common High Brass.

Gilding, Rich Gold Medal and Bronze, 7 cents per lb. more than Common High Brass.

Discount from List, 30 per cent.

PRICE LIST FOR BRASS AND COPPER WIRE

BROWN & SHARPE'S GAUGE THE STANDARD.	Com. High Brass	Low Brass	Gilding Bronze and Copper
All Nos. to No. 10, Inc	$0.23	$0.27	$0.31
Above No. 10 to No. 16	.23½	.27½	.31½
Nos. 17 and 18	.24	.28	.32
" 19 and 20	.25	.29	.33
No. 21	.26	.30	.34
" 22	.27	.31	.35
" 23	.28	.32	.36
" 24	.30	.34	.38

Discount, Brass Wire, 30 per cent.; Copper Wire, 40 per cent.

PRICES FOR SEAMLESS BRASS TUBING

From 2 in. to 3¾ in. O. D. Nos. 4 to 12 Stubs Gauge, 19c. per lb. Seamless Copper Tubing, 22c. per lb.

For other sizes see Manufacturer's List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	33	29	20	19	18	18	18	18	18	18	18	20	20	22	24	25

BRAZED BRASS TUBING

Brown & Sharpe's Gauge the Standard.

										Per lb
Plain	Round	Tube,	¾	in.	up	to	2	in.,	to No. 19,	inc.	$0 35
"	"	"	⅝	"	"		¾	"	" 19,	"	36
"	"	"	½	"	"		⅝	"	" 19,	"	38
"	"	"	⅜	"	"		½	"	" 19,	"	41
"	"	"	¼	"	"		⅜	"	" 19,	"	48
"	"	"	⅛	"	"		¼	"	" 19,	"	65
"	"	"	1	"	"		⅛	"	" 19,	"	1 00
	"	"	⅛	"	"		1	"	" 19,	"	1 50
Smaller than ⅛ inch											Special
2 inch to 3 inch, to No. 19, inclusive											38
3 inch											40
Over 3 inch to 3½ inch											45
Over 3½ inch											50

Bronze and copper advance 3 cents. Discount 30 per cent.

PRICE LIST FOR SHEET ALUMINUM

PLATE AND SHEET PRICE LIST.—B. & S. GAUGE.

Prices are for 50 pounds or more at a time. Less quantities, 5 cents per pound additional. Charges made for boxing.

Wider Than... And Including...	#3 in. 12 in. in coils.	6 in. 14 in.	14 in. 16 in.	16 in. 18 in.	18 in. 20 in.	20 in. 24 in.	24 in. 30 in.	30 in. 36 in.	36 in. 40 in.	40 in. 45 in.	45 in. 50 in.	50 in. 55 in.	55 in. 60 in.	Not wider than 6 in. Polishing One Side.	Not wider than 6 in. Sat. Fin. without Lacquer. One Side.	Polished two sides double above prices.	Satin Finish two sides double above prices.
No. 13 & heavier		42	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 14		42	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 15		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 16		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 17		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 18		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 19		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 20		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 21		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 22		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 23		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 24		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 25		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 26		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 27		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 28		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 29		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 30		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 31		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 32		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 33		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 34		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 35 & 36		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 37 & 38		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
" 39 & 40		43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
.008" to .0016"	66	43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10
Less than .0016"	66	43	44	44	44	44	47	47	47	48	48	49	50	2	6	8	10

Additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in. All columns except the first are for Flat Rolled Sheets.

Discounts as follows are given for sheet orders over 200 pounds.

200 to 1,000 pounds			10 per cent. off list.
1,000 to 2,000 "	10 per cent. and	2	" "
2,000 to 4,000 "	10 " "	3	" "
4,000 pounds and over	10 " "	5	" "

Sheets polished or satin-finished on both sides, double the price for one side.

Price Per Foot of Seamless Aluminum Tubing.

(CHARGES MADE FOR BOXING.)

THICKNESS OF WALL IN STUBS' GAUGE.

Outside Diameter in Inches.	No. 12.	No. 14.	No. 16.	No. 18.	No. 20.	No. 22.	No. 24.	Outside Diameter in Inches.
1-4	.....	.....	.....	10	9	8	7	1-4
5-16	.....	.....	.....	11	9	8	7	5-16
3-8	.....	.....	.....	12	9	8	7	3-8
1-2	.....	.....	17	14	11	9	8	1-2
5-8	.....	.....	21	16	13	12	.....	5-8
3-4	.....	.....	25	19	16	14	.....	3-4
7-8	.....	.....	28	22	18	16	.....	7-8
1	.....	.....	30	25	21	19	.....	.....1 00
1 1-4	.....	.....	36	30	25	.....	.....	.....1 1-4
1 1-2	.....	52	43	35	28	.....	.....	.....1 1-2
1 3-4	.....	60	50	41	33	.....	.....	.....1 3-4
2	84	68	58	47	37	.....	.....	.....2 00

Discount 20 to 30 per cent.

ALUMINUM

Drawn Rod and Wire Price List.—B. & S. Gauge.

Diameter B. & S. G'ge.	0000 to No. 10	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb	$ 38	38½	38½	0 39	39½	0 40	40½	0 41	0 42	0 43	0 44	0 47	0 53

200 lbs. to 30,000 lbs., three cents off list.
30,000 lbs. and over, four cents off list.

Additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in.
All columns except the first are for Flat Rolled Sheets.